

## **BRRRI Annual Report Summary 2008-09**

### **Program Area: Varietal Development**

#### **Plant Breeding Division**

Out of 311 crosses, 280 were confirmed. A total of 6910 plants were selected from F2 populations. From segregating generations 10692 progenies and 854 fixed lines were selected. In total, 535 advanced lines were selected from observational and yield trials

National Seed Board of Bangladesh (NSB) has recommended BR6902-16-5-1-1 as BRRRI dhan50 for cultivation in Boro season having extra long slender fine grain type and higher yield than the check varieties, Basmati-386 and BMDA Basmati. In T. Aman season, six premium quality rice genotypes were selected for yield, earliness and lodging tolerance along with long slender grain type.

Two submergence tolerant genotypes viz. IR85260-66-654-Gaz2 and Swarna-Sub1 showed one ton higher yield with eight days earliness compared to standard checks BR11 and Swarna, respectively under 16 days submergence condition. During T. Aman 2009, two advanced breeding lines viz BR5778-156-1-3-HR14 and BR5999-82-3-2-HR1 were tested in Proposed Variety Trial, those are suitable to cultivate in brackish shrimp field and can tolerate up to 6-8 dS/m salinity for whole life cycle and 10-15 days earlier than BRRRI dhan41 with similar yield.

Under standard Boro rice ecosystem, BG357 and BW328 showed 1.16 t/ha and 0.3 t/ha yield advantages respectively with higher degree of lodging tolerance and similar growth duration over BRRRI dhan28. In ALART, AS996 showed yield advantages 1.07 t/ha and 0.47 t/ha over BR14 and BRRRI dhan28, respectively. Under resistant breeding programme five advanced lines for BB, five for RTV, 43 for GM and five for BPH have been selected from observational trials. A total of 120 genotypes from diverse origin were selected from INGER nursery sets.

Under AWD condition, IR 83140-B-36-B-B showed 1.3 t/ha higher yield than the check BRRRI dhan28. On the other hand, under direct seeded aerobic condition, the highest yield was obtained from IR79477-65-3-1-1 (4.89 t/ha). Under drought stress condition, IR83614-8123-B, IR83614-315-B, IR78875-207-B-3-B, IR78942-B-2-B-B-2 and IR78942-B-2-B-B-1 showed 1.0-1.5 t/ha yield advantage than the checks. Development of rice varieties, with abiotic and biotic stress tolerance along with nutritional quality, was emphasized.

#### **Hybrid Rice Component**

Five test hybrids were showed heterosis over three local checks, which ranged from 6.93 to 65.06 %. The highest heterosis was observed from the combination of BRRRI 10A/BRRRI 12R

Using 11 CMSs 181 test crosses were made in 2008-09 of which 49 were elites and 55 were restorer lines. From 181 test crosses 26 F1s were found sterile. In back cross nursery 25 entries were found suitable for all characters and advanced for next generation.

In observation nursery, 75 experimental hybrids were tested. Among them only 28 were selected considering yield, duration and height compared to local checks BRR1 dlna31, BRR1 dhan33 and BRR1 dhan39. In the Boro season there were three promising hybrid combinations tested at 13 different locations. The combination IR58025A/BRR110R produced highest yield (3.23 t/ha) advantage over BRR1 dhan33 followed by the combination of BRR1IA/BR827R (2.82 t/ha) and BRR110A/BRR110R (2.78 t/ha), respectively.

The 12:2 = A:R ratio with 15- x 15-cm<sup>2</sup> spacing produced the highest yield (1.80 t/ha) of BRR1 hybrid dhan2. The combination IR58025A/BRR110R was observed highest yield at 150 kg/ha of urea application compared to 120kg and 180 kg/ha following one basal and three top dresses.

A combining ability experiment with 4L x 4T fashion was conducted and the highest yield (23.64 g) per plant was obtained. Evaluation of promising maintainers and restorers were done and found IR75595B (6.23 t/ha) and MH63R (6.84) over the highest yielder.

### **Biotechnology Division**

Twelve green plants were regenerated from the hybrid anthers of BRR1 dhan29 × FL378. BRR1 dhan48 showed the highest callusing ability in MS medium. MS medium performed better for callus induction over N6 and Nitsch and Nitsch medium. Molecular characterization was carried out on 50 BRR1 released varieties to observe the polymorphism. Out of 110 SSR markers tested, 51 markers showed polymorphism and 191 alleles were detected across 50 BRR1 released rice genotypes. The highest genetic dissimilarity (0.8222) was found between BR5 and BR21. The lowest genetic dissimilarity (0.0213) was found between BR22 and BR23. Most BRR1 released varieties were found with narrow genetic base. BHR1, BMDA Basmati, BRR1 dhan50 and Basmati 386 were used for diversity analysis by SSR marker and they were genetically distant. Twenty-three crosses were made with selected varieties/lines and these seeds will be used for future anther culture programme for development of high yield, salt tolerant and good quality double haploid lines. A total of 383 plants were selected and 39 apparently homozygous lines were bulked. GUS expression was found in putative transgenic calli but no regeneration was obtained. Three back crosses were made and a number of F1 seeds were obtained for gene pyramiding for resistance to BB.

### **Genetic Resources and Seed Division**

A total of 225 germplasm of which two B. Aus, five T. Aus, 30 jhum, 33 T. Aman and 155 Boro rice, were collected from different districts including hilly areas as well as other Divisions of BRR1. Among them, 147 advanced Boro lines were received from BSMRAU, Gazipur and one variety was acquired from Japan. A total of 383 germplasm were characterized with 45 morpho-agronomic characters in Aus and T. Aman seasons. Besides, 103 accessions in Aus, 1238 accessions in T. Aman and 323 accessions in Boro were rejuvenated. Apart from this, 448 new collections were registered. Information of about 500 accessions were added to the computerized Genebank database. Genetic diversity was pronounced in 33 aromatic rice germplasm and the varieties were grouped into seven clusters. Genetic diversity also pronounced in 40 traditional/local Boro rice germplasm and the varieties were grouped into nine clusters. Among 150 germplasm, only three showed moderately resistant against BPH, GLH and WBPH.

Krisnachura (Acc 477), Digha (491), and Sungwala (494) showed moderately resistant to BPH, GLH and WBPH. Among 50 genotypes, only nine genotypes showed tolerant to moderately tolerant (3-5) at the seedling stage of rice under high (12 dS/m) salinity stress. Among 33 rice germplasm, only three germplasm (BR5, Badshabhog, Thakurbhog) showed higher protein ranging from 10.3 to 11.1%. Besides, some accessions performed better in tests for different physico-chemical properties. Forty-eight BRRRI developed and recommended varieties were maintained as nucleus stock. A total of 102.23 tons of breeder seed, of which 22 tons from 24 varieties in T. Aman and 80.23 tons from 10 varieties in Boro seasons were produced during 2008-09. A total of 18.09 tons of breeder seed from 14 varieties in T. Aman, 62.13 tons from nine varieties in Boro and 1.47 tons from 10 varieties in Aus seasons were distributed. Around 4.35 tons truthfully labelled seeds (TLS) from 13 varieties of T. Aman and 3.17 tons TLS from nine varieties of Boro were available for distribution. Around 4.11 tons seeds from 14 varieties of T. Aman, 3.04 tons seeds from nine varieties of Boro and 10 kg from one variety of Aus were distributed as quality seed (TLS) during the reporting year. A total of 29.95 tons of TLS were also produced under 17.15% yield increase programme for rice at BRRRI HQ and regional stations while 45.60 tons of seeds were distributed to farmers through DAE as quality seed (TLS) during 2008-09. Four training programmes entitled 'Foundation seed production and preservation techniques of rice' was organized under breeder seed project for the scientists of BRRRI and SeedNet partners. Seven training programmes entitled 'Foundation seed production and preservation techniques of rice' was organized under STRASA, funded by Bill and Melinda Gates Foundation for SeedNet partners of stress prone areas.

### **Grain Quality and Nutrition Division**

T. Aman 2008-09 breeding lines were analyzed for acceptable physicochemical properties. Most of the lines were translucent and long slender to medium bold grain. One of the lines contained intermediate amylose and the rest contained high amylose. Milling outturns and elongation ratio of cooked rice were acceptable.

Twelve varieties of Adaptive Research Division (ARD) were analyzed. All the varieties were with long grain. Elongation ratio of cooked rice was not satisfactory level. Milling outturns were acceptable.

Milling outturns of submergence tolerant genotypes were satisfactory but head rice yield was unacceptable for two genotypes. More than 20% chalkiness was observed in one sample and two samples had low gelatinization temperature of the starch. Amylose content of imported 119 hybrid rice varieties was intermediate to low level except 6 varieties. Effect of field drying on milling yield of three aromatic rice varieties was not significant but significant effect was observed for Basmati386. Slowly digestible starch of traditional varieties was significantly higher than that of the HYV rice.

### **Program Area: Crop Soil Water Management**

#### **Agronomy Division**

Rice could be cultivated successfully by using residual effect of fresh poultry litter (FPL) even in third crop after its initial application, provided N deficiency is mitigated. BR7155-20-1-3, was suitable for

planting during August to mid-September in T. Aman season. AS996 produced higher grain yield in January planting. The authority may take necessary action to release these entries as varieties.

All the tested hybrid entries produced higher grain yield than BRR1 dhan28 and BRR1 dhan29 up to 15 January planting, but BRR1 dhan29 produced the highest grain yield over hybrid entries in later planting dates. Transplanting hybrid rice as late as February, gave 0.63-1.0 t/ha more grain yield than BRR1 dhan28. Hybrid rice and BRR1 dhan28 produced higher grain yield planted up to 1 March in Aman-Potato-Boro cropping system in Rangpur area. Sprouted seeds of BRR1 dhan46 could be broadcast @ 45-60 kg/ha along with N60P12K30 and N80P12K30 for satisfactory grain yield up to 15 September seeding. BRR1 dhan49 grown at 20- × 15-cm and 20- × 20-cm spacing along with 20% higher fertilizer than STB rate gave higher grain yield. A portion of N fertilizer could be saved through urea spraying depending on concentration and time of its spraying.

Fresh poultry litter and ash had positive impact on rice cultivation at saline area in Boro season. Sixty-day-old seedlings performed better than those of 40-day-old.

Application of fresh (0-3 day-old) poultry litter @ 6.0 t/ha produced satisfactory grain yield (~6.0 t/ha) which was comparable with chemical fertilizers in Boro season. Seven pre-emergence and nine post-emergence herbicides controlled weeds effectively in transplanted rice field. Application of 3.5 t/ha FPL and the rest amount of nutrients as of STB from chemical fertilizers was the best option for higher grain yield of Boro rice.

### **Soil Science Division**

Rice straw @ 4.5 t/ha increased grain yield by 14% and K use efficiency 7.6 kg grain/kg K and can substitute chemical K (66 kg K/ha/season). In addition to K supplement, continuous rice straw application results in an increase of soil organic matter (0.74% within five years) in Boro-Fallow-T.Aman cropping pattern. Rice straw @ 1 t/ha can save Tk 8,268 million per year in the national economy. Poultry manure (2 t/ha) along with integrated plant nutrient system (IPNS) based NPKS (100 kg N, 0 kg P and S, and 30 kg K/ha) gave 5.64 t/ha compared to 5.40 t/ha with soil test based (STB) chemical fertilizer (140 kg N, 30 kg P, 70 kg K and 20 kg S/ha) in Boro (BRR1 dhan29). Heavy metals (Cd, Pb, As, Cr and Ni) in the poultry manure were within the range of the allowable limit.

The economic level of N and P dose for BRR1 dhan30, BRR1 dhan49, hybrid EH1 and hybrid EH2 was 40 and 10 kg/ha. The economic level of P dose for the tested BRR1 varieties was 20 kg/ha in the Boro season. The K dose for BRR1 dhan30 and BRR1 dhan49 was found to be 40 and 60 kg K/ha and for hybrid EH1 and hybrid EH2 it was only 20 kg K/ha. For BRR1 dhan28 and BRR1 dhan45 it was 20 kg K/ha, while BRR1 dhan29 and BRR1 dhan36 required 80 and 40 kg K/ha respectively. In advanced line adaptive research trial (ALART), six advanced lines along with two checks (Swarna and Guti swarna) were tested against five rates of N (0, 30, 60, 90 and 120 kg/ha) in T. Aman season. BR7155-20-1-3 produced significantly higher grain yield (5.04 t/ha) where N was applied @ 30 kg/ha. Integrated fertilizer management experiment in a Potato-Maize-T. Aman cropping pattern showed that IPNS dose of fertilizer with 3 t poultry manure/ha produced the highest rice equivalent yield of 21.42 t/ha at Rangpur, while the farmers' practice produced the highest yield (14.89 t/ha) in Gazipur.

In the long-term missing element experiment, omission of N, P and K reduced rice yield by 2.86, 2.64 and 3.02 t/ha respectively in BR3 and 3.40, 2.90 and 2.00 t/ha respectively, in BRRI dhan29 in the 23rd year of the experiment. The magnitude of yield reduction in the T. Aman season was 0.60, 0.34 and 1.56 t/ha in BR11 and 0.51, 0.44, and 0.31 t/ha in BRRI dhan31 in Boro season respectively. Long-term continuous wetland rice cropping showed a significant declining yield trend (-0.13 t/ha per yr) in the nutrient control plot, but a slight increasing trend (0.06 t/ha/year) in the nutrient applied plot. Triple rice cropping produced higher yearly yield than double rice cropping. The treatments of chemical fertilizer (50% STB) + mixed manure (cowdung 2 t/ha + ash 1 t/ha + Azolla) produced the highest yearly yield (11.52 t/ha) in Boro-T. Aus-T. Aman cropping pattern compared to 8.81 t/ha in Boro-Fallow-T. Aman cropping pattern. Application of 7.5 kg/ha Zn along with 120 kg N/ha produced the highest yield (6.09 t/ha) at BRRI RS, Rajshahi. Application of Biostar produced 0.87 and 1.24 t/ha higher yield than the control plot at BRRI farm, Gazipur and at BRRI RS, Rangpur respectively, in Boro season.

### **Irrigation and Water Management Division**

Irrigation and Water Management Division of Bangladesh Rice Research Institute verified the center for environment and geographical information services (CEGIS) developed drought assessment model (DRAS). The divisional scientists made some modification of the model such as percolation rate and irrigation cut of date. With the modification, the model now predict net irrigation requirement (NIR) with more accurately.

In Sonagazi saline areas under Feni district, a suitable (non-saline) water bearing aquifer has been found at a depth at 162 m to 180 m (600 ft) from the land surface. Salinity (EC) of the water of this aquifer is only 0.37 dS/m, which is suitable for irrigation purpose. At present, many farmers of the adjacent areas are installing tubewells in this aquifer for irrigating their lands in dry season. It is expected that by utilizing the groundwater of this aquifer farmers will be able to grow rice in dry season. As a result, a mono cropped area will be converted into a multiple cropped area

An Experiment was conducted to determine the effectiveness of farm reservoir for crop production in the coastal area of Sonagazi. Rainwater harvesting in a reservoir with 25 cm height embankment conserved more water than without embankment. By utilizing this water Rabi crops could be irrigated in the coastal area. Rainfed T. Aman followed by irrigated tomato cropping sequence was found more profitable than other cropping sequences in Sonagazi coastal saline areas.

A study on alternate wetting and drying (AWD) showed that the technology is suitable for water and fuel saving during dry season (Boro) irrigation. It saved about 17 to 21% irrigation water, which could reduce irrigation cost about Tk 1,328 to Tk 1,822 per hectare. Additional benefits of AWD method over farmer's management practice were Tk 6,614/ha, Tk 6,144/ha and Tk 4,852/ha for BRRI dhan28, BRRI dhan29 and BRRI dhan45 respectively. Similarly for hybrid rice (Heera), additional benefit of AWD method over farmer's management practice was Tk 4,551/ha.

## **Plant Physiology Division**

Out of 150 genotypes, 11 were selected as tolerant (3) at the seedling stage of rice under high (12 dS/m) salinity stress. Among ten genotypes only two genotypes ie, BR7109-5R-4 and BR7084-3R-39 were better compared to the others including tolerant ck BRRi dhan47 under saline conditions through out the growth period.

All 14 major QTLs identified in seedling and reproductive stage of Boilam should not be targeted in breeding programme. From this work, we should target first on the QTL identified in chromosome 12, which overlapped with two QTLs identified for reproductive stage tolerance. Second, in the chromosome 8 where three reproductive stage QTLs overlapped on the same marker interval and finally the third QTL on the chromosome 9 and this is the major effect of QTL for seedling tolerance to salinity.

BR11 Sub1 breeding lines and three IRlines- PSB Rc68, IR07F291 and IR07F290 may be used in future breeding programme or tested in farmer's field for variety release. Holoï and Rajashahil performed the best under medium water stagnant conditions. Grain yield was adversely affected by submergence on ripening phase. Considering yield reduction BRRi dhan28 was less affected than BRRi dhan29. But the viability duration of submerged seed was higher in BRRi dhan29.

All light response curve showing characteristic Michaelis-Menten function. Considering different curve parameters ,BR17 was more energy efficient variety while BR3 and BR16 was found less efficient than the others. But our breeders releasing more energy efficient varieties in the recent years without any such photosynthetic data. The hybrid variety Hera2 had better performance for grain yield compared to BRRi dhan45 in Boro season. December 30 is the best planting time for Hera2 and BRRi dhan45.

## **Program Area: Pest Management**

### **Entomology Division**

Weekly survey in five habitats (seed bed, rice ratoon, grass fallow, irrigated rice and upland rice) at BRRi farm showed higher incidence of insect pests in Aus and T. Aman seasons. GLH population was higher in Aus and Boro seed beds and T. Aman rice fields. LBB and SPD dominated the natural enemy population in all the habitats and in all the seasons.

Higher incidence of insect pests occurred at Gazipur than other regional stations in light trap catches. GLH, BPH, WBPH, YSB and LHC dominated the pest population. Higher population of RLF was observed at Barisal. Like insect pests, maximum number of natural enemies were also found at Gazipur. LBB, CDB, STPD and GMB were the dominant predators. YSB (*Scirpophaga incertulas*) was found dominating the borer population infesting Aus crop at Kushtia. Higher population of RLF was observed in October and November. Application of N fertilizer showed no significant impact on the populations of GLH, GH and Spiders. August appeared to be the peak incidence period of GM in Kushtia region. Crops remaining at vegetative stage during this period suffered severely from GM infestation. Five parasitoid species of *Trichogramma* showed no significant variation in developmental period. All the species showed the some trend taking 7.86 to 8.0 and 12.6 to 14.09 days for developmental period in March to October and

November to February respectively. Among the six parasitoids evaluated, *Trichogramma zehri* was found capable of parasitizing hispa eggs. Lower yield losses due to rice hispa infestation were found in rice varieties BR1 (23.57%), BR26 (23.28%), BR25 (8.25%) and BR9 (12.97%).

Insecticides evaluated against different insect pests of rice showed that 63 insecticides were effective against BPH, 21 against rice hispa and 23 against YSB.

Application of granular insecticides for the control of YSB was found ineffective irrespective of infestation levels. Among the bioassay methods, Ringed method with rice seedling (RMWRS) was effective for the response estimates of BPH against insecticides. Three germplasm materials and two advanced lines were found moderately resistant against BPH, WBPH and GLH.

### **Plant Pathology Division**

During Boro 2008-09, survey of 26 rice fields of Rangpur, Kurigram, Lalmonirhat, Sherpur, Comilla and Noakhali districts revealed the occurrence of both leaf and neck blast disease in most of the fields. Disease incidence ranged from 5-98% with severity scale 3-9.

We reconfirmed six entries as resistant to blast and supplied the seeds to Plant Breeding Division for further use. Out of 235 entries six IRBN entries and one AWD showed resistant reaction to blast.

Based on reaction to bacterial blight and other characters 273 plants from F2 populations of two crosses were selected. In other tests, one INGER material and five cross materials showed R to MR reactions and 24 germplasms were confirmed as MR to bacterial blight disease.

Among 20 F6 entries, only BRC 171-2-1-2-2 showed resistant and BRC 234 (L-1) and BRC 241 (L-3) showed moderately resistant(MR) reaction against tungro. All the 18 submergence tolerant genotypes showed highly susceptible reaction to tungro. Out of 22 entries tested against ufra, five showed highly resistant and two resistant reaction.

Among the 20 BRRI released T. Aman varieties, BR4 and BRRI dhan47 showed resistant reactions to bacterial blight disease. Virulence test of 20 isolates of *Rhizoctonia solani* indicates that field isolates are highly diversified.

Forty-one isolates of *Xanthomonas oryzae* pv *oryzae* tested on nine near-isogenic lines (NILs). From the reactions to NILs the isolates could be grouped under eight pathotypes and pathotype-1 was the most predominant. In T. Aus BRRI dhan42, BRRI dhan27, and BR8 and in T. Aman, BRRI dhan37, BRRI dhan38, BRRI dhan39 and BRRI dhan46 showed better recovering ability from tungro.

A total of 18 isolates of *R. solani* appeared to be grouped in eight distinct clusters at 42% similarity level using VNTR and AFLP primers. Inoculation of BXo9 at maximum tillering stage leads to the highest yield loss in BRRI dhan49. Rice husk ash (2.0 t/ha) was found promising in controlling sheath blight disease. Greenzeb(2.4 kg/ha) and Nativo (250 g/ha) effectively reduced blast disease.

Two sprays with Rovral (1 kg/ha) or Tall (500 ml/ha) consistently reduced brown spot disease by more than 80%. Out of six fungicides, Bavistin and Unisaaf @ 1.5 kg/ha was effective against ufra.

The granular nematicides, Carbotaf5G, Autotaf3G and Emifuran5G @ 1 kg ai/ha were found effective against ufra in T. Aman.

## **Program Area: Rice Farming Systems**

### **Rice Farming Systems Division**

Rice Farming Systems Division Major cropping patterns were identified with their area coverage and land type in Mymensingh and Comilla regions. In the FSRD site, Moison, Kapasia intervention of FSR technologies on landless, marginal and small group of farmers increased their annual income by 71, 66 and 30%, respectively compared to the base year income.

BR11 in T. Aman, and BRRI dhan29 in Boro during 2008-09 season produced 15 and 34% higher grain yields respectively with BRRI recommended management practices than the farmers management practices in Kapasia. In T. Aman and Boro seasons, farmers' management practices combined with quality seeds and BRRI recommended fertilizer rate produced yield advantage of 10 and 23% compared to farmers' management practices.

Incorporation with maize crop residue did not affect the yield of DS Aman of Maize-DS Aman cropping pattern. The REY of DS Rice-Wheat-Mungbean cropping pattern was significantly higher in permanent bed (11.10 t/ha) than conventional method (9.48 t/ha). Rice yield was significantly higher in conventional practice while wheat and mungbean performed significantly better in permanent beds.

In T. Aman, double transplanting on 20 September with tillers of 30-day-old crop, produced maximum (4.71 t/ha) grain yield. In Boro, double transplanting on 20 February with tillers of 35-day-old crop, produced maximum grain yield (6.56 t/ha).

In T. Aman, 35 days retention of first planted crop at 10- × 10-cm spacing with nine seedlings per hill produced higher number of tillers at 55 DAT .In Boro, 45 days retention of first planted crop using 12 seedling per hill at the same spacing at 75 DAT is optimum for producing higher number of tillers.

During Boro 2008-09, the grain yield DSR was either comparable to or lower than that obtained in transplanted crop. Though seed to seed maturity duration was one to two week lesser in DSR than transplanting, it required one to three week longer main field duration.

Under late situation, double transplanting and the same day of normal transplanting (25 September in T. Aman and 25 February in Boro) produced significantly higher grain yield than that of normal transplanting in both T. Aman and Boro seasons. In Boro, the yield obtained from double transplanted rice (5.69 t/ha) was similar normal transplanted rice (5.79 t/ha).

In Boro, late transplanting irrespective of seedling age ( 75, 60, 45 days) grain yield decreased at 68 kg/ha per day from 20 February to 8 March planting in comparison to double transplanting with 75 days



tiller (35 days in seed bed and 40 days in the 1st transplanting). Double transplanting of Boro rice with 75 days tiller increased the grain yield of 19, 14 and 11% over seedling age of 45, 60 and 75 days respectively.

Potato-Boro-T. Aman cropping pattern produced the highest REY and gross margin, which was 168 and 202% higher than those of Boro-Fallow-T. Aman and Boro-T. Aus-T. Aman cropping patterns.

In partially irrigated highland ecosystem, DS BRRI dhan33-Tomato-Mungbean and DS BRRI dhan39-Tomato-Mungbean were found most productive and remunerative cropping patterns, which produced REY of 32.01 and 28.16 t/ha and gross margin of Tk 4,18,010 and 3,48,710/ha respectively.

Use of LCC in N management in BR11 and BRRI dhan46 produced an average yield advantage of 0.42 and 0.39 t/ha respectively over the farmer's practice. This was 0.31 t/ha for BRRI dhan29 in Boro season. On average about 12 and 34 kg N/ha were saved by use of LCC in Aman and Boro season respectively over the farmers' practice.

Productivity of improved cropping patterns under irrigated ecosystem with improved management practices was increased by 23 to 29% over farmer's management. Intercropping of tomato with sugarcane increased total gross margin from 60 to 75% than sole crop of sugarcane.

In multilocation testing of BRRI dhan46-BRRI dhan29-Fallow cropping pattern for medium high land phase II, the recommended patterns produced 4 to 23% higher grain yield over existing farmers' patterns. Seeds of BRRI dhan46 was distributed to the 90 farmers in nine blocks of Mymensingh Sadar, Gafargaon and Kapasis upazilas for adopting late planted rice in different late planted T. Aman based cropping patterns.

## **Program Area: Farm Mechanization**

### **Farm Machinery and Postharvest Technology Division**

Farm Machinery and Postharvest Technology Division Raised bed system produced the highest yield (6.01 t/ha) compared to conventional transplanting (5.66 t/ha). Water productivity is also higher (10.4 kg of grain/ha-mm) in bed planting compared to conventional practice (7.7 kg of grain/ha-mm).

The performance of wet and dry land weeder was satisfactory in terms of field capacity (in wet condition 6.14 decimal/h and in dry condition 6.34 decimal/h) and the degree of weeding (in wet condition 78.14% and in dry condition 88.86%). In dry condition, it is suitable for row planted vegetables, pulse, groundnut and rice. Seeding and fertilizer dispensing rate Bokto seeder were also uniform and placed at a proper depth. Crop yield was 3.29 t/ha. in Aus season.

BRRI developed a manually operated USG applicator to place the USG granules in the field mechanically. The applicator was designed for two rows operation in the field considering a spacing of 20- × 20-cm, depth of placement 6-8 cm. The weight of the applicator was around 10 kg. During laboratory test, more

than 98% dispensing efficiency was found. The average placement distance between granules was 39.5 cm during field operation although design distance was considered 40 cm. The depth of granule placement was observed 6.6 cm in the field. Considering the 2.7 gm size granules the calculated amount of fertilizer is 168 kg/ha. During field trials around 174 kg/ha granules was dispensed.

A power tiller operated field mower was designed and fabricated in the divisional research workshop. The speed of the mower blade was varied from 1200 to 1500 rpm. The average field capacity and cutting efficiency of the mower was found 50 decimal/h and 97.7% respectively.

A power hand reaper was developed using existing power unit of hand mower. Reaper part was designed using AutoCAD engineering tools. The reaper was fabricated in the divisional research workshop as per design. The average field capacity and fuel consumption was found 28.91 decimal/h and 2.62 lit/h respectively.

Sensory evaluation of three iron rich rice lines BR7517-2R-2-1, BR7517-2R-4-1 and BR7517-2R-27-3 (parboiled) and four premium quality rice {BRRI dhan50 (parboiled), Basmati-Pak (unparboiled), BRRI dhan50 (unparboiled) and Jasmine (unparboiled)} were evaluated for quality analysis. Forty panelists comprising male and female took part in the assessment process. In iron rich rice, 37.5 to 50% panelist expressed as good in appearance and 50% expressed BRRI dhan50 were good. In sensory evaluation, Basmati (Pak) white rice got the maximum scores followed by Jasmine and BRRI dhan50.

The maximum geometric mean diameter and percent of sphericity were found 3.55 mm and 43.02% in BR11 respectively. The volume of BR11, BR22 and BR23 was found 23.5, 17.71 and 24.6 mm<sup>3</sup> respectively. Maximum bulk density 579.71 Kg/m<sup>3</sup> was found in BR11. The highest value (37.9°) of repose angle was observed in BR23.

Field drying has significant effect on head rice recovery of Basmati386 rice. The average postharvest losses were found 10.42, 9.76 and 10.28% during Aus, Aman and Boro seasons for field operation (harvesting to drying). Postharvest loss was the highest in threshing operation (3.17%) followed by drying losses (3.14%).

By using briquette fuel stove for die heating of briquette machine, consumption of electricity was reduced to 49.99% of 72.16 kWh/t of briquette produced. After replacing the electric heater by stove, it was found that about 53 kg of fuel briquette for heating the die is needed to produce one ton of briquette.

An insulating system of the motor and blower for BRRI seed dryer was designed, fabricated and assembled. This newly fabricated BRRI seed dryer was tested successfully with no load condition.

A total of 600 participants were trained on operations and maintenance of BRRI developed farm machinery. Two-day-long training programmes on operation, repair and maintenance of farm machinery were conducted at Shreepur upazila in Gazipur district and Trishal upazila in Mymensingh district. A total of 20 participants including Sub-Assistant Agriculture Officers attended each of the training programme.

## **Program Area: Socio-economics and Policy**

### **Agricultural Economics Division**

BRR1 dhan28 and BRR1 dhan29 were the most popular rice varieties in Boro season covering 31 and 26% areas respectively. BR11 is still the dominant variety in T. Aman season occupying 32% area, while in Aus season, BRR1 dhan28 was the dominant variety. Among the BRR1 varieties, BRR1 dhan29 was the top yielder in Boro season (5.62 t/ha) and BRR1 dhan40 was the top yielder in T. Aman.

Rice farmers used more seed than the recommended rate irrespective of cropping seasons. Farmers applied comparatively lower amount of TSP and MP fertilizer in MV Aus and T. Aman crop. Boro rice farmers obtained higher yield but lower gross return. The farm-retail price spread was 25-28% of consumers' price, which is not so bulky in perspective of Bangladesh.

There was a strong and close proximity of inter regional price linkage attributed to good communication, better infrastructure facilities, which ultimately ensured maximum returns to the producers as well as expected reasonable price to the consumers.

Wheat area decreased due to high cost of cultivation and lower yield. Maize area increased due to higher yield and more profit. Potato, tomato and other vegetable areas increased due to higher profitability. LV Aus decreased but MV Aus area increased in both rainfed and favourable environments.

Farmers used more than 70 and 90% clean and healthy seed in Boro and T. Aman seasons respectively. The overall change in farmers' livelihood pattern was 58% in Sreepur and 75% in Amirpur due to use of quality rice seed.

In Monga area, BRR1 dhan33 is getting popularity for its earliness. The severity of Monga has reduced to some extent as GO and NGOs conducted various development programmes. Farmers obtained higher yield and higher return from growing BRR1 dhan47 in the delta areas. Farmers faced some constraints in adopting BRR1 dhan47, such as shattering, coarse grain and longer life span etc.

Farmers obtained higher yield and higher return from growing BRR1 dhan47 in the delta areas. Farmers faced some constraints in adopting BRR1 dhan47, such as shattering, coarse grain and longer life span etc. As a whole, there has been significant impact of the adoption of salt-tolerant technology on farmers' economic and social improvement.

### **Agricultural Statistics Division**

BRR1 dhan32 and BRR1 dhan40 were most stable in T. Aman season, while BR3 and BRR1 dhan33 were unstable among the non-aromatic rice. In aromatic rice, BRR1 dhan38 was most stable followed by BRR1 dhan37. BRR1 dhan29 was stable variety and BR6 appeared to be unstable in Boro season.

BR22, BRR1 dhan28 and BR16 were more preferable and cultivable varieties due to higher yield in T. Aman, Boro and Aus season respectively among the producers and producer cum consumers.

Production of rice increases nearly two times with unit increase in area. Growth rate in production and rice yield is greater than growth rate in area. Therefore, scientists should give more attention to develop sustainable variety in unfavourable weather to meet the increasing demand.

Overall wheat production in Bangladesh was not satisfactory during the study period. The overall trend of maize production in Bangladesh is satisfactory. Growth rate in production and yield of maize is greater than growth rate in the area indicating that maize production in Bangladesh has a bright future to meet the increasing demand. A total of 204 different analyses were performed during the reporting year. Besides, a number of maps were prepared using GIS and supplied to the scientists of other divisions whenever required.

### **Farm management Division**

The number of tillers, panicles and grain yield of BRRI dhan29 were significantly affected by weed control method and N sources. There was more profit when USG and super clean herbicide was used.

Harvesting of seed at 30 days after flowering produced the highest spikelet number panicle<sup>-1</sup>, seed yield, high density grain (HDG), fresh seed, germination percentage and vigorous seedling.

The total labour requirements for different operations of rice cultivation was 270, 276 and 281 man-day ha<sup>-1</sup> in Aus, Boro and Aman seasons respectively. The total variable cost was Tk 63,955, 71,783 and 81,712 in Aus, Aman and Boro seasons respectively. The gross margin also the highest in the Boro season (Tk 25,338) followed by Aman season (Tk 13,363) and Aus season (Tk 4,995). The cost of production of per kg rice was the highest in Aus season (Tk 15) followed by Aman (Tk 13.5) and Boro (Tk 12). The BCR was 1.11, 1.22 and 1.35 in Aus, Aman and Boro seasons respectively.

Cultivation of BR11 and BRRI dhan33 in T. Aman season was profitable in terms of both gross margin, net margin and BCR. In Boro season, the BCR varied from 0.80 to 0.94.

The average wage rate day<sup>-1</sup> varies from Tk 240 to 265. The wage rate day<sup>-1</sup> during the peak periods of the year Tk 270 to 295 in May, Tk 235 to 290 in July-August and Tk 270 to 300 in December-January.

The most important factors behind labours migration from this sector were marginal profit or loss, despair, need for land and capital, price hike of essentials, search for basic shelters, risky irregular work and always struggle for existence.

Seven thousand and sixty-seven (7,067) kg breeder seed was produced in collaboration with GRS division. Total labour utilization in different divisions for research purpose was 83,867.5 man days of which 61.54, 34.88 and 3.58% were utilized for research, support service and holidays respectively. A total of Tk 54,85,598.63; 31,09,315.37; 3,19,402 and 5,53,860 were paid to the labours for research work, support service works, leaves and festival grants respectively.

## **Program Area: Technology Transfer**

### **Adaptive Research**

In Aman, BR7155-20-1-3 produced consistently better yield (4.33 t/ha) than the other lines in all locations. But standard check, Gutiswarna produced significantly higher yield (4.75 t/ha) than BR7155-20-1-3. Considering grain yield, disease reaction and farmers' perceptions, none of the advanced lines was found suitable for proposed variety trial (PVT).

In Boro, BR7323-4B, BR7166-5B-5, AS996, BR7166-50-1-Ran1 and IR7011-89-3-7 along with BR14 and BRR1 dhan28 as checks were tested. Considering grain yield, growth duration and other performance, BR7323-4B and AS996 may be considered in proposed variety trial (PVT). Advanced lines, IR74963-262-5-1-3-3, IR69515-KKN-4-UBN-4-2-1-1 and PSBRc82 along with BRR1 dhan28 as standard ck were tested for AWD and none of the advanced lines found superior to BRR1 dhan28 in Boro season.

In Lum system (Aus-Aman mixed cropping), BRR1 dhan27 produced nearly three times higher grain yield than the local Aus cultivar, Surjamoni shaita. Drum seeded rice produced 8% increased grain yield over broadcasting both in Nesarabad and Banaripara.

Application of poultry manure at 2 t/ha could substitute full dose of phosphate fertilizer.

About 8% higher grain yield and nine days earliness were found in DWSR than TPR irrespectively of varieties and locations. Application of USG was urea saving technology both in Aman and Boro seasons.

Farmers were motivated to use LCC. BRR1 dhan27 produced the highest yield (3.1t/ha) among all other local hilly varieties in jhum cultivation.

The Adaptive Research Division (ARD) conducted 27 rice schools at different locations of the country in which 945 trainees participated.

### **Training**

A total of 2,661 participants from different government and non-government organizations and farmers were trained through 83 training programmes. The highest number of participants was from the Department of Agricultural Extension (DAE). All the participants of one-month training achieved the distinction category certificates with 229% knowledge improvement. The overall improvement of knowledge of extension personnel through 1-week Rice Production Training (RPT) was 246 and 419% for regular course and 17.15% rice yield increase programme, respectively. During 1974 to June 2009 BRR1 conducted 2,057 training programmes. In all 56,560 participants were trained on different aspects of rice production technologies. Participants of both the 17.15% yield increase and one-week regular course mentioned that the duration of the courses was not enough for better understanding of all the modern technologies of rice production and suggested for increasing course duration to two-week and long course from one-month to two-month. The overall performance of the BRR1 speakers was very good. Essential information about recent rice production technologies are included in the BRKB.

## Regional Station

### BRRR RS, Barisal

BRRR RS, Barisal In RYT somaclone line BRRR dhan29-SC3-28-L16 showed similar grain yield to BRRR dhan28 with four days shorter growth duration. In multilocation trial ,BRRR hybrid entry-1, 2 and 3 produced 15, 24 and 19% higher yield respectively, than BRRR dhan28 with similar growth duration.

Bacterial blight (BB) was the major disease in Aus, Aman and Boro seasons but blast and ufra were major in Boro season in BRRR farm Barisal. Hydazim, Seadazim, Antisika, CPZim 80WP and Kasumin application reduced disease incidence significantly compared to the control plot, but no grain yield improvement.

In Boro season, the highest yield (4.86 t/ha) was recorded in N150K60 and the lowest (2.82 t/ha) in the control plot. Nitrogen application did not increase grain yield of BRRR dhan27 in any planting dates. Early planting (6 April) produced lower grain yield (2.6 t/ha) with higher sterility (54%).

Different fertilizer management practices did not increase grain yield of BRRR dhan44 and Sadamota substantially in T. Aman in tidal flooded situation.

Wider spacing (30- × 30-cm and 40- × 40-cm) produced statistically similar grain yield to 20- × 20-cm in BRRR dhan44 and Sadamota in all planting dates except 8 September, when 20- × 20-cm spacing produced the higher yield. Sadamota yielded higher in 10 and 21 August planting compared to BRRR dhan44 due to tidal submergence just after establishment.

Application of organic manure in T. Aman did not increase the soil health as well as grain yield. But in Boro, poultry manure, kesery relay and dhaincha incorporation increase the grain yield.

The SPAD based nitrogen management did not increase the grain yield of hybrid and inbred rice varieties due to less urea consumption when the critical threshold value was 35.

Irrigation management I1 (irrigation was applied when water depth was 15 cm below from the surface) produced the highest grain yield (5.5t ha<sup>-1</sup>) when USG was applied. The highest weed infestation (119.60 gm m<sup>-2</sup>) was observed in I3 (irrigation was applied when water depth was 30 cm below from the surface) with the application of USG.

At Sagardi, tide came on 5 July and four tidal peaks were observed in this month. Early transplanted Aman rice was affected by tides occurred in July and mid-August. The highest tidal peak was 60 cm occurred during the first week of August. Late T. Aman was mostly damaged in the first week of September. An unusual tide was observed on 26 May 2009 due to cyclone AILA, which damaged transplanted Aus and matured Boro rice.

### BRRR RS, Comilla

Twenty-five crosses were made in Boro season, out of which 16 were confirmed and 185 plant progenies were selected from segregating generation in T. Aman and Boro season with high yield potential along with earliness and photoperiod sensitivity. Six genotypes were selected from regional

and advanced yield trials for further evaluation. The yield potential of 12 hybrid genotypes in T. Aman and six genotypes in Boro were ranged from 1.38-5.09 t/ha and 5.58-8.20 t/ha with 107-138 days and 139-156 days growth duration respectively.

Twenty-seven SCA hybrids were evaluated in two sets during T. Aman season. Yield and growth duration ranged from 1.70-5.56 t/ha and 102-135 days. During Boro, 111 entries were tested in six sets. Yield and growth duration ranged from 4.98 to 9.65 t/ha and 128-155 days. Six fungicides were tested against rice blast at farmer's field and the lowest percent incidence of panicle blast was found in Nativo treated plot. Eight rice diseases were identified in Comilla region. Among them sheath blight, bacterial blight and blast were major but the severity of individual disease varied with season and location.

The optimum N dose for maximum grain yield of BRRi dhan47 was 83.5 kg/ha. Seven late T. Aman (photosensitive) varieties were evaluated at farmers' field of flood prone area. BRRi dhan46 produced highest grain yield (4.91 t/ha). During Boro, 24,959 kg breeder seeds of BRRi dhan28, BRRi dhan29 and BRRi dhan45 and 4,594 kg TLS of BRRi dhan28, BRRi dhan29 were produced. In demonstration trial BRRi dhan46 produced average one t/ha more yield than BR22 at farmer's field during T. Aman season. In Boro, BRRi dhan43 produced 0.66 t/ha more yield than BRRi dhan28 over 12 locations. The station organized 11-day-long farmers training courses on modern rice production technologies.

#### **BRRi RS, Habiganj**

Forty F5 and 214 F6s plants of DWR were selected for trials. BR224-2B-2-5 (1.86 t/ha) and BR5925-B-2 (1.84 t/ha) yielded very close to standard check HbjAIV (1.83 t/ha) with similar survival rate in SYT. Bazail-65 (2.20 t/ha), Gabura (2.20 t/ha) and Lalkhama (2.00 t/ha) yielded very close to standard check HbjAIV (2.10 t/ha) with similar survivality in SYT of local promising DWR varieties. In Boro 2009, 471 F4s plant were selected from 18 F3s. Another 502 F4s plant was selected from 11 F3s. In PYT, IR74286-55-2-3-2-3 (8.30 t/ha) yielded higher than BRRi dhan29 (7.70 t/h) with same growth duration. Five entries yielded higher than BRRi dhan28 (6.60 t/ha) and BRRi dhan45 (5.50 t/ha) with similar growth duration in AYT # E. None of the entries out yielded BRRi dhan29 in AYT # L. In RYT, BR7009-81-1-2-1 out yielded BRRi dhan29. In RYT # Iron, yield of all the lines were lower than BRRi dhan29. BRRi dhan29-SC3-8 yielded (8.50 t/ha) close to BRRi hybrid dhan2 and 0.6 t/ha higher than BRRi dhan29 (7.90 t/ha) in RYT # somaclone. BR7166-5B-5, BR7011-89-3-7, BR7323-4B-1 and AS996 yielded higher than the checks BR14 and BRRi dhan28 with little bit longer growth duration in ALART. Four desirable rows (lines) were selected in respect to phenotypic traits and uniformity in purification of BR19. Significantly higher rice yield (6.53 t/ha) was obtained with complete fertilizer dose of NPKS kg/ha and the lowest rice yield (4.40 t/ha) in all the missing treatment. The highest rice yield of 6.63 t/ha was obtained with 100 kg K/ha and the lowest rice yield was obtained with K control. Use of 12 seedlings with 15- × 15-cm spacing produced significantly higher number of tillers for second time transplanting of BRRi dhan29 under DT systems. Comparatively higher yield was observed from 2/3 of recommended N as basal + 1/3 20 DAT for N management of under Boro-Fallow-Fallow cropping pattern. BRRi dhan46 yielded 1.89 t/ha higher compared to checks. Farmers were satisfied about performance of BRRi dhan46 in respect to suitable for late transplanting, high yield, less disease incidence, insect infestation, non-lodging, coarse grains, more tiller/hill and drought tolerance characters. Farmers of Sunamganj district preferred both BRRi

dhan44 and BRR1 dhan46 due to higher yield, strong, tall plant and less diseases. BRR1 dhan45 yielded 6.05 in haor areas. The highest yield was obtained from BR15 (7.43 t/ha) followed by BRR1 dhan29 (7.32 t/ha) and BR16 (7.31 t/ha) in stability analysis trial. Seventeen-one-day training were conducted for 510 farmers of neighbouring villages of Habiganj district on modern rice cultivation.

#### **BRR1 RS, Kushtia**

None of the iron-dense lines performed better than the check varieties in RYT. During panicle initiation (PI) to flowering period, water requirement was 560mm but rainfall 227 mm indicating requirement of supplemental irrigation for successful crop production. Drought assessment (DRAS) model predicted relatively optimum net irrigation requirement (NIR), which was slightly higher than BRR1 recommended water management practice for Boro rice. *Scirpophaga incertulas*, dominated (81.6%) the borer population. *Chilo polychrysus*, population was 13.8% and *Sesamia inferens* was only 4.6% in Aus season. The peak incidence (11.31%) of gall midge was observed in August. BR15 performed the best among the 22 test varieties followed by BR19, BRR1 dhan28, BRR1 dhan45 in Boro season.

BRR1 dhan34, BRR1 dhan39, BRR1 dhan44, and BRR1 dhan46 were selected for T. Aman 2008 whereas, BRR1 dhan28, BRR1 dhan29, BRR1 dhan36 and BRR1 dhan45 were selected for Boro 2008-09 seasons for performance demonstration and quality seed production.

#### **BRR1 RS, Rajshahi**

Among nine premium quality rice materials, BR6922-4-4 produced the highest yield (5.79 t/ha) followed by BR6926-1-1-1-2 (5.53 t/ha). As iron and zinc rich materials, BR7528-2R-20-1 produced higher grain yield (6.24 t/ha) over the check varieties. Eleven genotypes were selected based on screening against midge infestation. The highest grain yield of 4.62 t/ha was obtained in BR7642-1-3-2 followed by 4.30 t/ha of BR7640-42-3-3. In total 39 bulk and 65 progeny were selected from pedigree nursery trial. BRR1 dhan29 produced the highest yield (5.59 t/ha) followed by BRR1 dhan29-SC3-28-L8-HR2 (5.4 t/ha). BR85260-66-654 produced the highest grain yield (5.11 t/ha) with 143 days growth duration followed by Swarna Sub 1 (5.02 t/ha) and the lowest was in IR64 Sub 1 (3.11 t/ha). As a normal crop, the highest grain yield was obtained in BR85260-66-654 (5.06 t/ha) followed by Swarna Sub 1 (4.85 t/ha) and BR11 Sub 1 (4.64 t/ha) that was similar to BR11 (4.54 t/ha) and Swarna (4.82 t/ha). A total of 22 and 10 entries out yielded the check varieties in OYT (stress) and OYT (control), respectively. Fifteen and nine entries out yielded than the check varieties in AYT (stress) and AYT (control). Twelve and eight advanced lines out yielded the check varieties in AYT-greater than stress and AYT-greater than control respectively. In Aus season, 35 kg N/ha and 30 April transplanting would be optimum for BRR1 dhan27. Irrespective of treatments and variety, the highest grain yield (5.06 t/ha) was obtained in BRR1 dhan49 when applied the highest amount of nutrient and the lowest (2.48 t/ha) in IR55419-04 with no fertilizer. In general, grain yield and growth duration increased with increased rate of nutrient applied. Growth duration was increased from 10 to 15 days when planted 45-day-old seedlings compared to 25 days. Among the 27 entries, only seven hybrid entries yielded more than 5 t/ha. Among the 111 entries, only 16 entries yielded more than 7.50 t/ha. Integrated management of Hexaconazole and potash top-dressed controlled sheath blight disease effectively. Grain yield drastically reduced in farmer's practice due to



high infestation of sheath blight disease. Gutti Swarna produced higher yield (4.68 t/ha) than ALART materials in Aman 2008. AS996 produced the highest yield (5.81 t/ha) and the lowest was in BRRi dhan28 (5.27 t/ha). Farmers preferred the line AS996 perhaps due to higher grain yield with medium growth duration (151 days) and cold tolerance. The highest grain yield (5.62 t/ha) was obtained in the entry PSBRC82 whereas the lowest yield (4.71 t/ha) was in IR74963-262-5-1-3-3. Around 25% irrigation water was saved following AWD technology. In farmers' preference analysis, BRRi dhan33 and Barke3004, BRRi dhan49 and BINA dhan7 occupied first, second and third position, respectively at Godagari Rajshahi while BR7155-20-1-3, BRRi dhan49 and IR74371-54-1-1 at Nachole, Chapai Nawabganj. BR7155-20-1-3 was infested by sheath blight disease. Three hundred eighty farmers including 57 female farmers and 40 SAAO were trained up under 12 one-day rice production training courses.

### **BRRi RS, Rangpur**

Swarna Sub1, BR11 Sub1, IR64 Sub1 and Samba Mahsuri Sub1 showed survival percent 97, 90, 96 and 82% in 12 days submerged condition but it decreased to 22-23% in 16 days water stress condition except IR64 Sub1 (2%). Submergence duration did not hamper on survival of IR64 Sub1 and survived 96 and 94% in 12 and 16 days water stress condition. IR64 Sub1 matured within 113 DAS and obtained 3.94 t/ha. IR64 Sub1 and BRRi dhan33 showed lower yield potential than long duration BR11 and Swarna Sub1.

Swarna Sub1 showed higher yield than its check Swarna but BR11 Sub1 produced lower yield than its check BR11 and other entries yielded lower than 4 t/ha except BRRi dhan32 (2.5 t/ha) in non-submergence normal condition. Swarna Sub1, BR11 Sub1 and other submergence tolerant lines produced lower yield than checks BR11 and Swarna in non-submergence normal condition. The submergence tolerant IR line IR85260-66-285 produced higher grain yield when submerged at any DAT. A total of 7,784 kg breeder seeds and 7,092 kg truthfully labelled seed (TLS) were produced and disseminated during 2007-08.

BRRi regional station, Rangpur developed a BRRi Monga Mitigation Model (BMMM). It provides complete package programme of early Aman rice production and crop diversification for employment and food security during a lean period.

Twenty farmers, 11 other government and non-government organization personnel had received training on Sub1 rice production packages and seeds of Sub1 lines were distributed to the farmers for cultivation.

BRRi RS, Satkhira Seedling survival of BRRi dhan28 and BRRi dhan47 was higher and grain sterility was lower in the older seedlings (50 and 60 days) than the younger ones.

USG produced the highest yield (6.65 t/ha) with BRRi dhan47 followed by 160 kg N (6.46 t/ha) and 120 kg N (6.01 t/ha). Effect of Gypsum application in saline soil was variable. Early planting before January might be the way to avoid adverse effect of natural capillary salinity on crop growth and yield contributing parameters.

Seedling age over 40 days was comparatively resistant to transplanting shock in saline soil environment. Transplanting four seedlings/hill increased the seedling survival in saline soil environment.

#### **BRR1 RS, Sonagazi**

Cultivation of kleshari as a relay crop in T. Aman suppressed soil salinity raising than fallow land. Vietnamese varieties, AS996 and OM576 having more than 4 t/ha may be considered as potential varieties for saline prone area during Aus season. In Aus season, transplanting of dibble plant in another field may be a good practice to cover more area in saline prone region for obtaining similar yield as of dibbled method. BRR1 dhan40 and BRR1 dhan41 in wet seeding method can give an yield advantage of 1 ton/ha than Rajasail in char area. Nitrogen @ 120 kg/ha in three splits with basal application may be a good practice for obtaining higher rice yield in coastal charland during Boro season. Harvesting of rain water in a mini pond for irrigating some root, fruit and leafy type vegetables grown after T. Aman may create an opportunity for the rice growing farmers to have high value economic crops.